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ABSTRACT

This paper reports on research that examined longitudinal data on students entering Tennessee Board of Regents institutions of higher education after the implementation of a state-mandated developmental studies program. The program identifies and helps at-risk students to persist in college to graduation. Data analysis is presented from a 1986 cohort of 16,611 entering freshmen, studied over a 3-year period. The primary focus of the study is whether the developmental studies program helps retain students who are underprepared. Conclusions on the following questions are presented based on the study data: (1) How many students are underprepared? (2) Are the placement tests functioning well? (3) How do the rates of retention compare for students who placed in developmental courses and for students who placed in college courses? (4) At what rate do students pass college mathematics if they placed directly in college mathematics as compared to being placed in and completing developmental mathematics first? (5) How do pass rates compare for developmental and college level students when they enroll in college English or a college social science course? and (6) At what rates are developmental and college level students graduating? Contains 11 references. (GLR)

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IMPACT OF STATE-MANDATED DEVELOPMENTAL STUDIES ON COLLEGE STUDENT RETENTION

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Objectives

In the United States, about 16% of the population 25 years and older hold baccalaureate degrees. In Tennessee, 13% hold baccalaureate degrees. Throughout the 1980's, public policies were adopted in Tennessee to increase the educational level of the state's citizens. In Tennessee, state-supported institutions of higher education enroll 32% of each year's high school graduates and play a key role in producing two- and four-year degree holders. This study examines longitudinal data on students entering Tennessee Board of Regents (TBR) institutions of higher education after the implementation of a state-mandated developmental studies program. This program was designed to identify underprepared students who were not likely to persist in college to graduation and to provide academic and student services so that these students would succeed in college. An important feature of this study is the comprehensiveness of the data set. The data set contains information on the 1986 cohort of 16,611 entering freshmen which has been studied over a period of three years. Of equal importance is the establishment of a baseline with which to compare succeeding cohorts of entering freshmen on several variables: ACT scores, placement in developmental courses in mathematics, reading, and writing, retention in college, success in college courses after completion of developmental courses, and graduation. This study reports conclusions drawn from the data and describes the impact on secondary schools and institutions of higher education. The central focus is whether the developmental studies program helps retain students who are underprepared.

Review of Research on Retention

This review of research on retention spans the 60's through the 80's when open admissions policies increased the diversity of student abilities, ages, and social, racial, and ethnic origins. Marsh (1966) provided a review of the college dropout phenomenon from the perspective of the 60's. Cope and Hannah (1975) used the 1970's term, "revolving college door", to highlight the fact that the lack of "fit" between non-traditional students and the type of college to which they were being admitted accounted for increasing attrition rates.

Several studies reported retention and graduation rates for national samples. Panos and Astin (1968) determined from a national sample of

248 colleges and universities (60,078 students) that 65 percent of the 1961 entering freshmen had completed four or more years of college by the summer of 1965. At the time of the study, 50% of men and 62% of women had received baccalaureate degrees. The National Longitudinal Study of the High School Class of 1972 provided a representative sample of college students at 1,800 institutions in the United States enrolled in academic programs (generally leading to a baccalaureate degree). Peng and Fetters (1978) found from the National Longitudinal Study data that after two years, the persistence rates in academic programs were 66% for four-year and 50% for two-year institutions. These two studies used questionnaires sent to students. The following two studies used institutional data submitted to the American College Testing (ACT) program. Beal and Noel (1980) used ACT program data to determine that two-year public open admissions institutions retained 1977-78 freshmen at a rate of 54% while four-year public open admissions and liberal admissions institutions retained at rates of 60% and 66% respectively. Beal and Noel also found the graduation rate for two-year public open admissions institutions was 42% for 1975 freshmen three years after entrance. For four-year public open admissions and liberal admissions institutions the graduation rates were 46% and 56% respectively for 1973 entering freshmen five years after entrance. Noel, Levitz, and Saluri (1985) found a 68% retention rate when analyzing ACT data from 2,432 United States colleges and universities. The data reflected the percentage of full-time freshmen who entered college in the Fall, 1981 who returned to the same college in the Fall, 1982.

Tinto (1982) presented aggregate rates of degree completion in the U. S. from 1880-1980. He calculated percent of completion as number of BAs or first professional degrees given in any year divided by the number of first-time degree enrollments four years earlier. He reported a nearly stable rate of 55% for completion of first degree.

As can be seen from the above five studies, there is variability in retention and graduation rates. These studies are difficult to compare because they involve retention over different lengths of time, different types of institutions and different research methodologies.

Theoretical Framework on Student Retention

Bean (1982) cited the following authors and their models of student attrition as sources of variables he used to develop a synthetic model:

Spady, Tinto, Pascarella, Fishbein & Ajzen and himself. In Bean's synthetic model, four background variables are seen as having greater influence on attrition than eight other background variables. The four variables are mother's education, father's education, high school grades, and achievement test scores. Bean (1982) states, "The most important of these variables is probably performance (high school grades and ACT scores), which predicts from about 25 to 50 percent of the variance in college grades" (p. 26). An institution can not change a student's background, but can deny admission or offer programs to overcome lack of academic preparation. A main focus of the Tennessee Board of Regents (TBR) developmental studies program is providing mandatory placement in developmental courses. These developmental courses in mathematics, writing, reading, and study skills aim to help students overcome deficiencies in academic preparation.

A second category of variables in Bean's model are called organizational. They have to do with how a student experiences a higher education institution. Important variables in this category are as follows: close friends, informal contact with faculty, grades, membership in campus organizations, curriculum (availability of preferred courses), and discussed leaving with either outsiders or insiders. Some of these variables can be manipulated through student services and/or attention to increasing informal contacts with faculty. In the TBR developmental studies program, institutions were encouraged to develop a variety of student services such as counseling and peer tutoring.

A third category consists of environmental variables such as opportunity to transfer or get a job, family approval of the institution, and likelihood of marrying. These variables are outside the control of the institution. A fourth category involves outcome and attitudinal variables such as the value a student places on education, boredom, confidence, certainty of choice, loyalty, certainty of major, educational goals, and absenteeism. Tinto (1982) points out that "Although we may be justified in trying to complement the skills of some individuals who, because of prior experiences, are not adequately prepared for college work, one should question the wisdom of becoming significantly involved in attempting to modify peoples' value orientations as to the worth of higher education" (p. 696).

Bean's (1982) final category has only one variable, intent to leave. He notes that this category "is hypothesized to be the the best predictor of dropout and to subsume most of the attitudinal, organizational,

environmental, and background variables in explaining the variance in dropout" (p. 29). This variable is valuable in predicting who will drop out, but can not be directly manipulated to lower attrition. These last categories in Bean's model were not directly addressed in the TBR developmental studies program.

Tinto (1982) offered several comments on the limitations in studies of student attrition. Models of student attrition explain only a portion of complex behaviors and are not well developed to account for a number of aspects of attrition. Academic failure and voluntary withdrawal are quite different aspects of dropping out. Financial need may affect choice of institution; and match between individual and institution may affect the likelihood of dropping out. Financial concerns are more likely to impact retention early in a college career rather than later. Studies are needed to examine the role of finances in student attrition. There is mobility in higher education with students transferring in-state, transferring out-of-state, and leaving higher education. The inability to distinguish transfers from drop outs is a limitation of the data available on the TBR developmental studies program.

Tinto (1982) goes on to note that retention differs by gender, race, age, and socioeconomic background. There is a need to develop models of attrition for different groups. Two year institutions differ from four year institutions in attrition rates; and less is known about attrition at two year institutions. Variables involving academic and social integration are influenced by type of institution and whether the institution is largely residential. In this study of the TBR developmental studies program, gender, race, and age groupings were examined as was institutional type.

Regarding programs to reduce attrition, Tinto (1982) stated:

> However constructed or designed, no program to reduce attrition is better than its implementation and management within the institution. It is one thing to conceive of, even design, an institutional retention effort; it is another to implement and manage one within the often rigid maze of institutional structures. Here several concluding observations are called for. First, successful retention programs are most frequently longitudinal in character. Second, they are almost always integrally tied into the admission process. Third, their implementation generally involves a wide range of institutional actors. Not infrequently, successful retention programs become opportunities for institutional self-

> renewal, an outcome which, in the long-run, may be more beneficial to the institution's well-being than the simple reduction of dropout rates. (p. 699)

The TBR developmental studies program study is longitudinal. The program is tied to the admission process. It was implemented in two and four year institutions across the TBR system. It has led to many changes within institutions.

A recent study (Pelavin & Kane, 1990) reported on high school courses which act as "gatekeepers" influencing who goes to college and who is likely to be retained to graduation. The data base was a survey of a nationally representative sample of 15,941 students from the 1980 cohort in the High School and Beyond Study. Pelavin and Kane found that demographics, college aspirations, and high school course work were strongly associated with college attendance. These variables are similar to Bean's (1982) background variables. Pelavin and Kane reported that lower-income and minority students were less likely to take geometry, laboratory science, and foreign languages, courses which are considered college preparatory. Of primary importance was the finding that students who plan to complete a college degree and who take geometry were much more likely to attend college than other students. The report recommended raising student aspirations for college. It also recommended requiring certain college preparatory courses to decrease differences in college attendance across racial/ethnic or income groups.

Pelavan and Kane (1990) also looked at obtaining senior status or a bachelor's degree. Using census data, they reported that whites completed four years of college at a rate of 25.1 percent. Blacks and people of Hispanic origin completed at rates of 12.3 percent and 9.8 respectively. Using the High School and Beyond Study data, they found that the course most strongly associated with obtaining senior status or a bachelor's degree within four years was high school geometry. They recommended that

> schools consider the strategy of requiring mastery of algebra and geometry of all students and that schools develop a plan to encourage college aspirations in all students. The data suggest that these are potentially powerful strategies for increasing minority and poor students' participation in college. p. 79

The TBR developmental studies program designated arithmetic, geometry, algebra I, and algebra II as high school level work. Students underprepared in these subjects must successfully complete developmental courses through algebra II prior to enrolling in college mathematics.

Data Source and Methods

The Tennessee Board of Regents (TBR) authorized the Academic Assessment and Placement Program (AAPP) for its system of 6 universities and 14 two-year institutions for implementation in Fall, 1985. All entering degree-seeking freshmen are screened for academic readiness for college study with the ACT followed by further testing of students determined to be at risk of failure. Students are assessed with system-wide tests in writing, reading, and mathematics and are mandatorily placed in appropriate developmental or college courses according to common cutoff scores. One goal of the program is to make college accessible to underprepared students. Another goal is to ensure that students in college courses have the prerequisite skills to succeed in freshman-level work.

Data are collected system-wide. Demographic data, entering ACT scores, placement scores and course enrollment data are available for 16,000 to 20,000 entering freshmen for each of the years 1986 through 1990. Follow-up data is available for the 1986 cohort of 16,611 students. These data include grades in college courses upon completion of developmental courses, continued enrollment in college, and completion of graduation requirements as of Spring, 1990. These data were analyzed to answer questions such as the following:

1. How many students are underprepared?
2. Are the placement tests functioning well?
3. How do the rates of retention compare for students who placed in developmental courses and for students who placed in college courses?
4. At what rate do students pass college mathematics if they placed directly in college mathematics as compared to if they placed in and completed developmental mathematics first.
5. Similarly, how do pass rates compare for developmental and college level students when they enroll in college English or a college social science?
6. At what rates are developmental and college level students

graduating?

Analyses of data from the state-mandated developmental studies program has been carried out by two different committees. The first ad hoc Committee on Assessment and Evaluation began its work in January, 1988. It produced a report on program effectiveness for the period of Fall 1986 to Spring 1987 ("The Effectiveness", 1988). The second committee began work in October 1990 and did a follow-up report for the period from Fall 1986 to Spring 1990 ("The Effectiveness", 1991). Both reports dealt with data on the 1986 cohort of entering degree-seeking freshmen. This cohort entered college in either Summer or Fall of 1986. The members were TBR staff and faculty and administrators of TBR institutions.

Board staff supplied the committees with data tables. The committees compiled data from these tables which answered questions pertinent to the evaluation. Most of the analysis involved compilation of numbers of students who met certain characteristics, i.e. who had been placed in developmental courses, who had passed a mathematics course after completing the final developmental mathematics course, or who had graduated. These numbers were used to calculate percentages. In many cases, students who were initially placed in developmental courses were compared with students who were initially placed in college courses. Several tests of statistical significance were conducted. However, with large sample sizes, small differences in percentages are statistically significant. Therefore, the committee focused on interpreting the educational significance of differences to determine the impact of the developmental program.

Conclusions and Educational Importance of the Study

This study's findings are related to the six numbered questions in the Data Source and Methods section. The findings are noted here in conjunction with actions taken based on the findings. This study is educationally significant because its findings are being used to formulate policy and guidelines state-wide which impact educational quality and equity.

1. How many students are underprepared? Underpreparedness in Tennessee in the TBR institutions is an extensive problem. For all institutions and for the 1986 cohort, 50% of entering freshmen required remediation in mathematics, 38% in reading, and 37% in writing. Overall, 54.9% of the cohort required remediation in one or more subjects.

Comprehensive developmental programs at each institution were planned and implemented. In addition, efforts were made to collaborate with secondary schools to improve the level of preparation of students leaving high school. One such effort is a feedback report to each high school detailing how each of their recent graduates performed in the placement screening, and in aggregate how the school compares to all high schools in the state. Schools are reminded that the report contains information only on the school's graduates who enrolled in college in the TBR system. Students who do not attend college or who attend college outside of the system are not included. However, the message being delivered to high schools is that large numbers of students who enroll in TBR institutions directly out of high school are underprepared for college study.

Chart 1 gives a brief profile of the 1986 cohort:

Chart 1

Description of 1986 Cohort

By Institutional Type:		By Race:	
Universities	8,512 (51.2%)	Black	2,987 (18.0%)
2-Year Inst.	8,099 (48.8%)	Non-Black	13,624 (82.0%)
By Age:		**By Gender:**	
< 21	13,030 (78.7%)	Male	7,541 (45.4%)
≥ 21	3,581 (21.3%)	Female	9,070 (54.6%)

Total: 16,611

About as many students attended two-year institutions as universities. Blacks constituted a minority of 18%. The majority of students were under 21 years of age. Females were in a slight majority.

Chart 2 contains information describing developmental and non-developmental students. There were more developmental students than non-developmental students in the 1986 cohort. The majority of Black students were placed in developmental courses while non-Black students

were about equally placed in developmental and college courses. Students less than 21 years of age were about equally placed in developmental and college courses. The majority of older students placed in developmental courses. The placement of males and females in developmental courses was about the same with slightly more than half being placed in developmental.

Chart 2
Description of Developmental and Non-Developmental Students

By Enrollment:		By Race:	
Dev.	9,140 (54.9%)	Black Dev.	2,230 (74.7%)
Non-Dev.	7,471 (45.1%)	Black Non-Dev.	757 (25.3%)
Total	16,611	Total	2,987
		Non-Black Dev.	6,910 (50.7%)
		Non-Black Non-Dev.	6,714 (49.3%)
		Total	13,624
By Age:		By Gender:	
< 21 Dev.	6,493 (49.8%)	Male Dev.	3,949 (52.4%)
< 21 Non-Dev.	6,537 (50.2%)	Male Non-Dev.	3,592 (47.6%)
Total	13,030	Total	7,541
≥ 21 Dev.	2,647 (73.9%)	Female Dev.	5,191 (57.2%)
≥ 21 Non-Dev.	934 (26.1%)	Female Non-Dev.	3,879 (42.8%)
Total	3,581	Total	9,070

2. Are the placement tests functioning well? The placement tests and cut off scores provide an operational definition of underpreparedness.

Therefore, their functioning is fundamental to the program. The first report ("The Effectiveness", 1988) examined data on placement and recommended adjustments to improve the functioning of the placement tests.

The TBR developmental studies program came into being after the passage of The Tennessee Comprehensive Educational Reform Act of 1984. This act designated as curricula in state high schools the basic academic skills named in Project EQuality, a report by The College Board. These skills reflect broad national consensus on what a student needs to know and be able to do to be prepared for college. These same skills are also important preparation for the world of work. Placement testing in the developmental studies program is based on the Project EQuality basic skills. The first screening to determine underpreparedness for entering students involves the ACT. In 1985, students under 21 years of age with an ACT composite score of less than 16 and students 21 and older were to be tested in mathematics, writing, and reading. System-wide cut off scores for the testing were set to reflect preparation for college level work. For example, in mathematics, the level of high school algebra II was designated as a prerequisite for students taking college mathematics.

As mentioned previously, one goal of the program is to ensure that students in college courses have the prerequisite skills to succeed in freshman-level work. After the implementation of the program, each institution conducted an audit of level 1 or freshman courses to ensure that each course presumed that students have Project EQuality skills. For example, mathematics courses were to presume that students had geometry and algebra II skills.

The data analysis influenced policy and program guidelines. The goal was to determine which students were underprepared and to place them accurately in appropriate developmental courses. The committee recommended that ACT subscores rather than just the composite score be used to determine who should be tested for underpreparedness. When the ACT-E (Enhanced) test battery was adopted in summer and fall 1990, institutions were required to review ACT-E English and mathematics subtest scores as well as the composite score. Any student with a composite or subtest score of 18 or less was referred for further assessment. The administration time for the reading comprehension test and writing sample were increased. The committee recommended adoption of new versions of the reading and mathematics tests. These new versions were developed by the Educational Testing Service to better

reflect Project EQuality skills. The first test versions had been published prior to Project EQuality. Each of these recommendations arose from data analysis and reflected the goal of accurately placing students in courses appropriate to their preparation.

It is possible to trace the effect of these changes longitudinally. Tables 1 and 2 present data for the five freshman cohorts from 1986 to 1990. The number of students in the freshman cohort has increased from 16,611 in 1986 to 20,044 in 1990, an increase of 17%. The most noteworthy change to be seen in Table 1 is the increase in percentage of the cohort who were required to take placement tests for each subject from 1989 to 1990. The ACT was used from 1985 through 1989. The ACT-E was adopted in 1990; and subscores on it in English and mathematics were used to determine who should take placement tests in writing and mathematics. More students were **tested** with placement tests in the new process involving the ACT-E as an initial screen.

Table 1
Percentage of Cohort **Tested** By Subject

Year	No. in Cohort	Math	Writing	Reading
1986	16,611	53	54	50
1987	18,285	53	52	49
1988	19,807	57	52	49
1989	20,610	59	54	52
1990	20,044	67	59	54

Changes in the ACT screen were accompanied by changes in placement tests, in cut off scores, and in test administration time. These changes affected the percentages of the cohort **placed** in each subject as seen in Table 2. Students took new placement tests which covered more of the EQuality Project skills than before. These new tests had different cut off scores. The net effect of these changes was that the percentage of the cohort **placed** in mathematics rose from 56% in 1989 to 64% in 1990. The change was not as large in writing. On the writing test, student were allowed 25 minutes rather than 20 minutes to produce a writing sample. The percentage of the cohort **placed** in writing rose from 37% in 1989 to

40% in 1990. In reading, the percentage of the cohort **placed** fell from 38% in 1989 to 34% in 1990. There were a number of differences in reading testing which contributed to this change. In 1990, students took only a reading comprehension test. Previously they took both a reading comprehension and a logical reasoning test and were placed by the lower score of the two. The reading comprehension test was new and based on EQuality Project skills. The new test had different cut off scores. The test administration time was increased from 30 to 45 minutes.

Table 2
Percentage of Cohort **Placed** By Subject

Year	No. in Cohort	Math	Writing	Reading
1986	16,611	50	37	38
1987	18,285	48	36	37
1988	19,807	53	35	37
1989	20,610	56	37	38
1990	20,044	64	40	34

At the time of the implementation of the TBR developmental studies program, a policy change on university admissions was announced. For high school students graduating in 1989, state universities required 13 high school units including algebra I, algebra II, geometry or advanced mathematics, two units of science (one with a lab), social studies, U. S. history, two units of a foreign language, and four units of English. Many efforts were launched to inform the public of this change to ensure that students were prepared for university admission. The two-year institutions retained an open admission policy. The implementation of the university admission requirements produced a shift in enrollment and placement in developmental courses as shown in Table 3. University enrollment decreased from 9,319 in 1988 to 8,549 in 1989 to 7,234 in 1990. The overall decrease was 22%. Enrollment in two-year institutions increased from 6,992 to 8,152 to 8,479 from 1988 to 1990. The overall increase was 18%. Less prepared students were not admitted to universities and enrolled in two-year institutions causing an enrollment increase.

There was also a shift in placement from 1988 to 1989.

Universities placed smaller percentages of students in developmental mathematics, reading, and writing in 1989 than they had in 1988 before the admissions requirements. It is not possible to follow the effects of admissions requirements in the 1990 data because there were changes in the ACT, in the placement tests, in the cut off scores, and in test administration times.

Table 3
Percentage of < 21 Year Olds Recommended for Placement
By Subject and By Institutional Type

Year	Type	No. in Cohort	Math	Writing	Reading
1986	Univ.	7,753	31	24	24
	2-Yr.	5,313	64	56	50
1987	Univ.	8,422	26	23	24
	2-Yr.	6,202	65	53	46
1988	Univ.	9,319	38	24	23
	2-Yr.	6,992	63	51	44
1989	Univ.	8,549	35	22	21
	2-Yr.	8,152	64	50	54
1990	Univ.	7,234	38	18	21
	2-Yr.	8,479	73	45	48

Throughout the period of data collection, there have been efforts to communicate with high schools on improving the preparation of students for college. The TBR sent teams of educators to nine sites across the state to explain the developmental studies program and university admissions requirements. They prepared a number of flyers and publications including a yearly feedback report to each high school on the performance of its students on placement tests at TBR institutions. The feedback reports beginning in 1989 also summarized the number of students entering higher education with high school unit deficiencies. The Tennessee Collaborative for Educational Excellence brings representatives of all of state higher education, K-12 faculty and staff, and The College Board together at yearly Collaborative Academies and in Task Forces to work on easing the transition from high school to college. It was hoped that, with time, fewer recent high school graduates would require remediation in college. It is not yet possible to see a lowering of placement rates for students under 21 years of age in the years 1986 to

1990 (Table 4). It is important to note that not all recent high school graduates who go on to college attend TBR institutions. Therefore, the data in this study can not be used to evaluate of how well prepared all Tennessee high school graduates are. It is also possible that screening more entering freshmen into placement testing, changing placement tests, and using different cut off scores is increasing the level of performance required for placement in college courses.

Table 4
Percentage of <21 Year Olds Recommended
For Placement by Subject

Year	No. in Cohort	Math	Writing	Reading
1986	13,066	44	37	35
1987	14,624	43	36	33
1988	16,311	49	35	32
1989	16,701	49	36	32
1990	15,713	57	33	35

3. How do rates of retention compare for students who placed in developmental courses and for students who placed in college courses? The first committee's report ("The Effectiveness", 1988) addressed this question. Short-term retention rates from Fall, 1986 to Spring, 1987 for developmental and non-developmental students were 82% and 87%, respectively, for universities. The rates were and 58% and 55% for developmental and non-developmental students, respectively, for two-year colleges. Developmental students were retained at about the same rate as non-developmental students. In the literature review, there were no studies of retention for a comparable period of time. A more usual time span is from entrance in fall of one year to enrollment fall of the next year. Beal and Noel (1980) found that two-year public open admissions institutions retained at a rate of 54% for a one year period which is comparable to the two-year college rate in Tennessee. Noel, Levitz, and Saluri (1985) found a 68% retention rate for colleges and universities for a one year period against which the rate for Tennessee universities may be compared. The 1988 report concluded that, in the short term, the developmental program was contributing to retention of

underprepared students. Other factors in retention such as age, sex, race, and part-time vs. full-time status were examined; and the findings were used to plan for increasing student retention.

The second committee report ("The Effectiveness", 1991) looked at longer-term retention from Fall, 1986 to Spring, 1990. This data is the first available system-wide data on long-term retention and will be used as a baseline for evaluation of program effectiveness for the 1988 and 1990 cohorts. The definition of a student who is retained for this period is one who either graduated as of Spring, 1989 or was enrolled as of Spring, 1990. The retention rates are conservative because students who transfer to other institutions are not tracked and, therefore, can not be counted as having been retained. Also, a student who has "stopped out" of college for the Spring, 1990 semester is not counted as having been retained, even though the student may return in a subsequent semester.

Retention (graduation or enrollment Spring, 1990) for the 1986 cohort is described by the data in Table 5. Universities retained students at a higher rate than did two-year institutions.

Table 5
Retention Rates of Students by Institutional Type
Fall 1986 to Spring 1990

	Total Cohort Fall 86	No. Enrolled Or Graduated Spring 90	% Enrolled Or Graduated Spring 90
University	8,512	3,923	46
Two-Year	8,099	1,710	21

This time span is comparable to the time span in Panos and Astin's (1968) study. They found that 65 percent of the 1961 entering freshmen had completed four or more years of college by the summer of 1965. They used a survey methodology which counted students who had transferred from the institution entered as a freshmen which may partially account for their finding of 65% as compared to the 49% in Tennessee universities. No comparable rates were available from the literature review for two-year institutions. A three year time span for retention studies of two-year institutions is more usual in the literature. It is likely that a number of two-year institution students transfer without graduating. It is also

likely that the intent to obtain a degree differs between students who choose a two-year institution over a university. These and other factors may contribute to the low rate of retention at Tennessee two-year institutions.

A comparison was made between retention rates for students who placed in developmental courses (Dev.) and for students who placed in college courses (Non-Dev.). The data are presented in Table 6.

Table 6
Retention Rates of Developmental and Non-Developmental Students
by Institutional Type
Fall 1986 to Spring 1990

	Dev. Cohort Fall 86	% Enrolled Or Graduated Spring 90	Non-Dev. Cohort Fall 86	% Enrolled Or Graduated Spring 90
University	3,267	39	5,245	51
Two-Year	5,873	21	2,226	20

The retention rate for developmental students at two-year institutions was about the same as the rate for non-developmental students. The retention rate for developmental students at universities was less than the rate for non-developmental students. These data are the first system-wide data on long-term retention and will be used as a baseline for evaluation of retention for 1988 and 1990 cohorts.

Other comparisons were made which have program implications. Younger students (under 21 years of age) were retained at a higher rate than older students. Male and female students are retained at about the same rate. Black students at universities were retained at about the same rate as non-Black students (43% compared with 47%). Black students at two-year institutions were retained at a lower rate than non-Black students (13% compared with 23%). Retention efforts at institutions may have to target special groups to make changes in retention rates from these baselines.

4. At what rate do students pass college mathematics if they placed directly in college mathematics as compared to if they placed in and completed developmental mathematics first? Students who placed in and completed developmental mathematics and subsequently enrolled in a

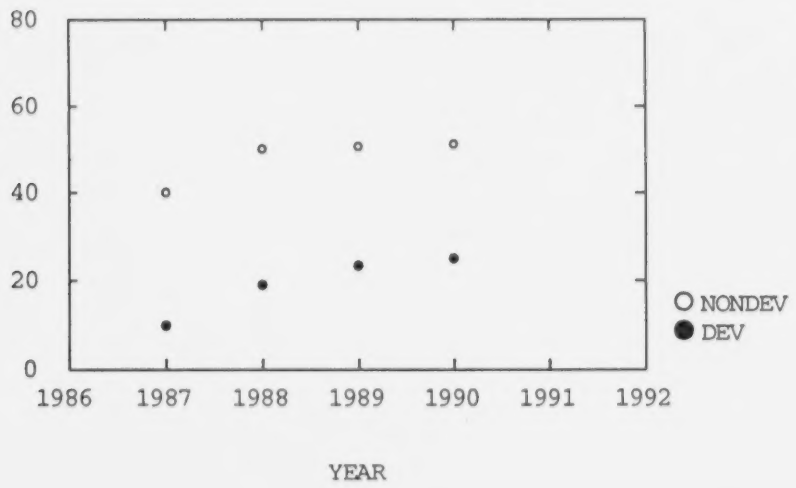
college mathematics course had a pass rate (D grade or better) of 81%. Students, who entered college mathematics without needing developmental placement, passed at a rate of 79%. It was concluded that the developmental mathematics curriculum was helping underprepared students pass mathematics in that they were passing at about the same rate as non-developmental students.

There is nationwide concern that mathematics acts as a critical filter. The Pelavin and Kane (1990) study reported on the strong association between high school background in mathematics and college participation and success. In the TBR study, longitudinal data were available on student completion of the first college mathematics course attempted. As indicated in Table 7 and Graph 1, non-developmental students enrolled in and successfully completed college mathematics at a higher rate than did developmental students. Many of the developmental students were still enrolled in developmental mathematics in 1987. However, the curves for both groups level off and have similar slopes from 1988 on. The difference between the 1990 endpoints of the curves in Graph 1 represent the difference in percentages of developmental and non-developmental students who had successfully completed college mathematics. Through Spring, 1990, 51% of the students who required no remediation in mathematics had successfully completed a college course in mathematics as compared to 25% of students who placed in developmental mathematics. The difference is 26 percentage points. This information is a benchmark against which to try for improvement for both developmental and non-developmental students. Failure to complete a first college mathematics course constricts the flow of students into science, mathematics, and engineering majors and is a barrier to graduation from a major requiring mathematics.

Table 7
Number of 1986 Cohort Placed and Number Completing
A College Mathematics Course with a D Grade or Better

Placement	No. Placed	1987	1988	1989	1990
Dev. Math	8,322	817	1615	1968	2115
College Math	8,289	3343	4060	4174	4259

Graph 1
Percent of 1986 Cohort Completing
A College Course in Mathematics with
A D Grade or Better



5. How do pass rates compare for developmental and non-developmental students when they enroll in a college English or social science course? Developmental course-completers passed college English and social science courses at rates slightly less than non-developmental students. In English, developmental course-completers in writing passed college English at a rate of 88% compared to a rate of 91% for non-developmental students. Student performance in the social science courses of history, sociology, psychology, and political science was examined. The pass rate of students who completed developmental reading courses was 4 to 9 percentage points lower than the pass rate of non-developmental students in the four college social science courses. It

was concluded that system-wide, developmental students have been successful in passing college courses.

6. At what rates are developmental and non-developmental students graduating? For the 1986 cohort, the data available allow students to be tracked through Fall, 1989 which is three academic years and a semester. The expectation is that few students would have obtained baccalaureate degrees in this period, but that some students would have completed certificates and associate degrees. There were a total of 1069 graduates from the cohort of 16,611 for a graduation rate of 6.4% A breakdown of the graduates is shown in Table 8.

Table 8
Graduation Rates of the 1986 Cohort
Through Spring, 1989

	-----Dev. Students----			---Non-Dev. Students--		
Type of Instit.	No. of Students	No. Graduated	%	No. of Students	No. Graduated	%
TBR	9,450	665	7.0	7,161	404	5.6
Universities	3,398	48	1.4	5,114	115	2.2
Two-Year	6,052	617	10.2	2,047	289	14.1

System-wide, a larger percentage of developmental students (7.0%) completed degrees than did non-developmental students (5.6%). The majority of the 1069 graduates (62.2%) began as developmental students. Another comparison is needed to put graduation rates in perspective. Developmental students represented 74.7% of the two-year cohort. Therefore, it might be expected that more developmental students would graduate in this period of time because there were more developmental students in the two-year cohort.

Summary

This study reports on an extensive statewide effort to provide greater excellence and equity in postsecondary education. Data from the first evaluation in 1988 was used to make adjustments in the process of screening with the ACT, in selecting new placement tests, in setting common cut off scores for the System, in adjusting the testing times and in writing new guidelines for the program. Additionally, each institution

was supplied with data tables broken down by institution for program improvement. Institutions are developing retention programs appropriate to institutional needs. Data from the program is also shared annually with high schools as part of a larger collaboration to improve the preparedness of entering freshmen.

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